

RF Transistor for Low Noise Amplifier

10 V, 70 mA, $f_T = 5.5$ GHz typ.

NSVF5501SK

This RF transistor is designed for RF amplifier applications. SSFP package is contribute to down size of application because it is small surface mount package. This RF transistor is AEC-Q101 qualified and PPAP capable for automotive applications.

Features

- High Cut-off Frequency: $f_T = 5.5$ GHz typ. ($V_{CE} = 5$ V)
- High Gain: $|S_{21e}|^2 = 11$ dB typ. ($f = 1$ GHz)
 $|S_{21e}|^2 = 19$ dB typ. ($f = 400$ MHz)
- SSFP Package is Pin-compatible with SOT-623
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- RF Amplifier for RKE
- RF Amplifier for ADAS
- RF Amplifier for Remote Engine Starter

SPECIFICATIONS ABSOLUTE MAXIMUM RATINGS at $T_A = 25^\circ\text{C}$

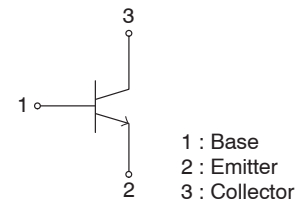
Symbol	Parameter	Value	Unit
V_{CBO}	Collector to Base Voltage	20	V
V_{CEO}	Collector to Emitter Voltage	10	V
V_{EBO}	Emitter to Base Voltage	3	V
I_C	Collector Current	70	mA
P_C	Collector Dissipation	250	mW
T_J, T_{stg}	Operating Junction and Storage Temperature	-55 to +150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

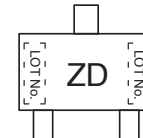


SOT-623 / SSFP
CASE 631AC

ELECTRICAL CONNECTION NPN



MARKING DIAGRAM



ZD = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

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ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$

Symbol	Parameter	Conditions	Value			Unit
			Min	Typ	Max	
I_{CBO}	Collector Cutoff Current	$V_{CB} = 10\text{ V}, I_E = 0\text{ A}$			0.1	μA
I_{EBO}	Emitter Cutoff Current	$V_{EB} = 2\text{ V}, I_C = 0\text{ A}$			1	μA
h_{FE}	DC Current Gain	$V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$	100		160	
f_{T1}	Gain-Bandwidth Product	$V_{CE} = 3\text{ V}, I_C = 5\text{ mA}$	3.0	4.5		GHz
f_{T2}		$V_{CE} = 5\text{ V}, I_C = 20\text{ mA}$		5.5		GHz
C_{ob}	Output Capacitance	$V_{CB} = 10\text{ V}, f = 1\text{ MHz}$		0.95	1.2	pF
C_{re}	Reverse Transfer Capacitance			0.6		pF
$ S_{21e} ^2_1$	Forward Transfer Gain	$V_{CE} = 5\text{ V}, I_C = 20\text{ mA}, f = 1\text{ GHz}$	8	11		dB
$ S_{21e} ^2_2$		$V_{CE} = 5\text{ V}, I_C = 20\text{ mA}, f = 400\text{ MHz}$	16	19		dB
NF	Noise Figure	$V_{CE} = 3\text{ V}, I_C = 5\text{ mA}, f = 1\text{ GHz}$ $Z_S = Z_L = 50\ \Omega$		1.9		dB

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Pay attention to handling since it is liable to be affected by static electricity due to the high-frequency process adopted.

TYPICAL CHARACTERISTICS

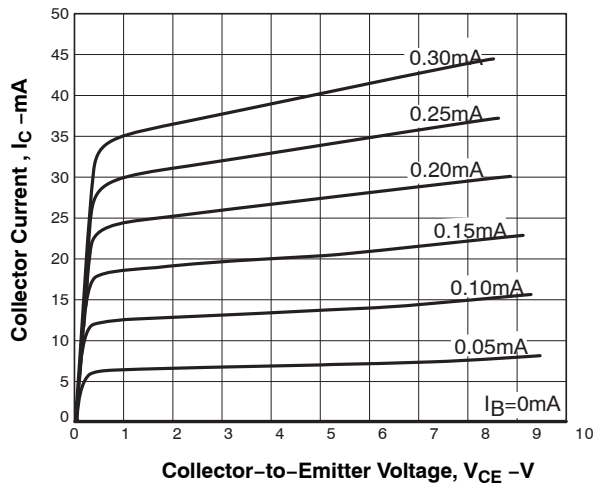


Figure 1. $I_C - V_{CE}$

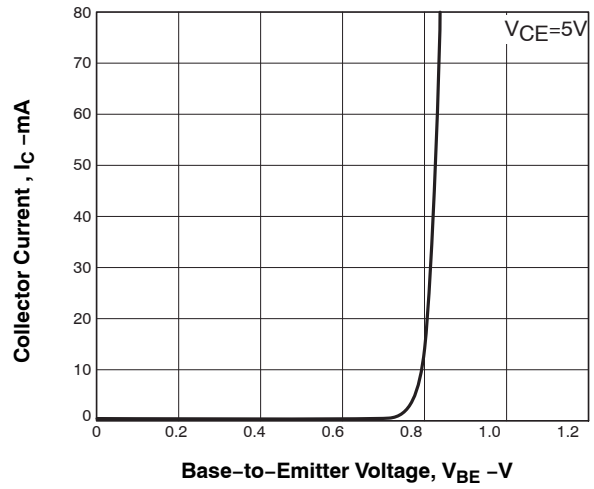


Figure 2. $I_C - V_{BE}$

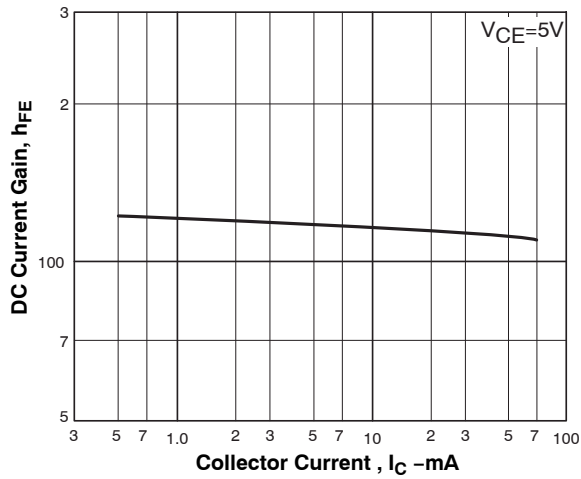


Figure 3. $h_{FE} - I_C$

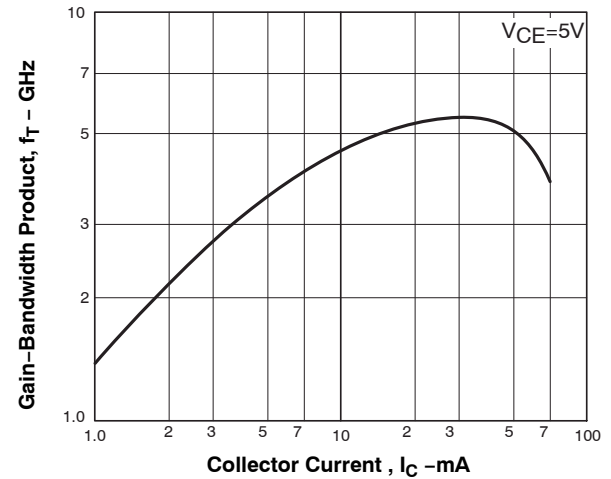


Figure 4. $f_T - I_C$

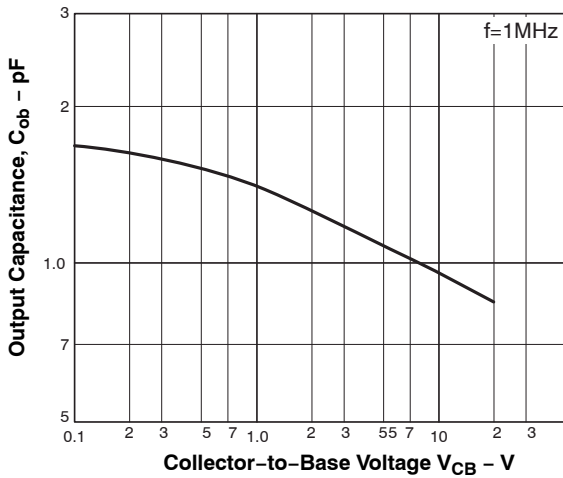


Figure 5. $C_{ob} - V_{CB}$

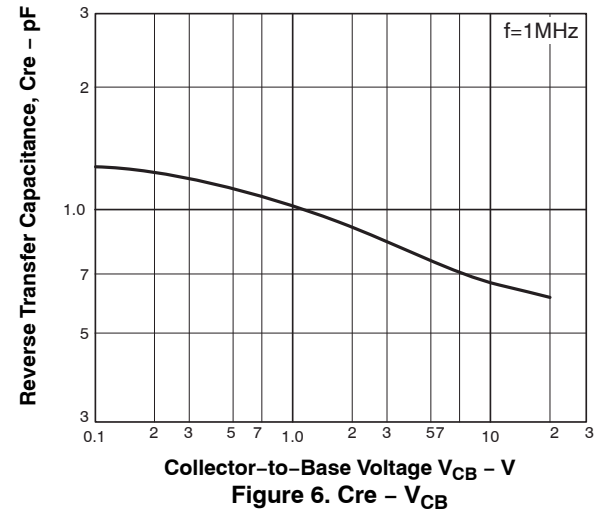


Figure 6. $C_{re} - V_{CB}$

TYPICAL CHARACTERISTICS (continued)

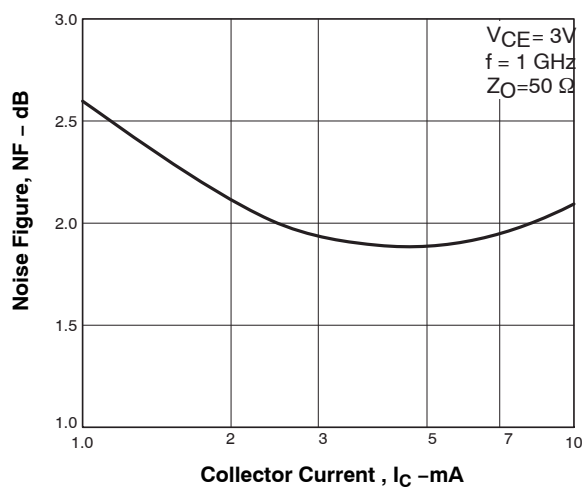


Figure 7. NF – I_C

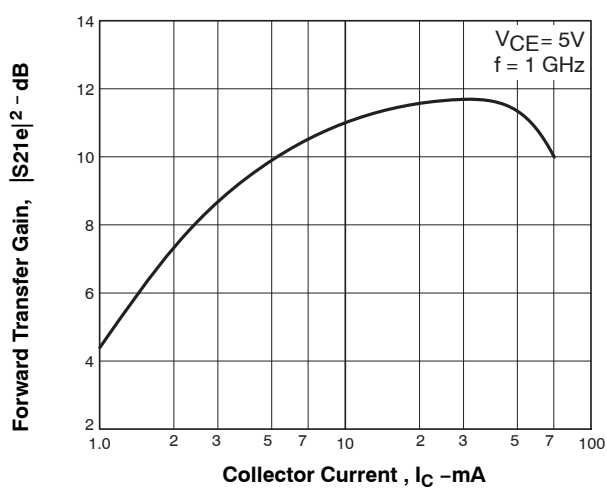


Figure 8. $|S_{21e}|^2$ – I_C

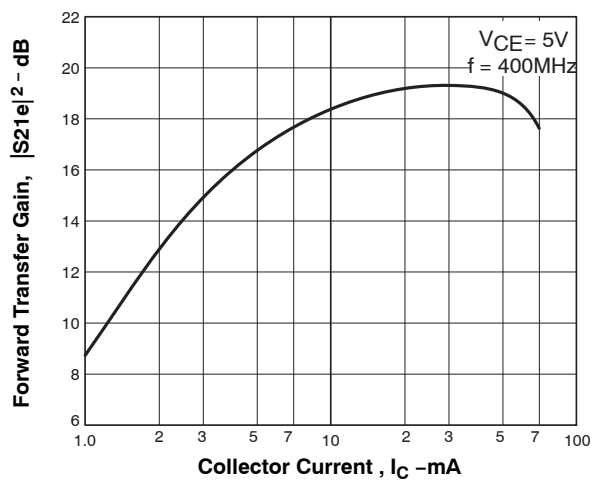


Figure 9. $|S_{21e}|^2$ – I_C

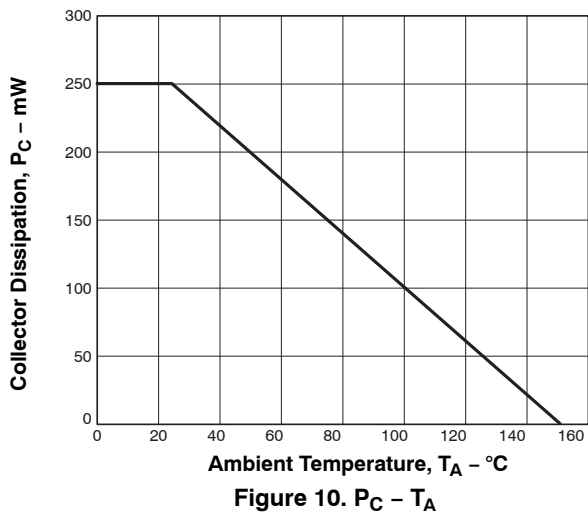


Figure 10. P_C – T_A

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S PARAMETERS (COMMON EMITTER)

Freq(MHz)	S11	∠S11	S21	∠S21	S12	∠S12	S22	∠S22
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$V_{CE} = 5\text{ V}$, $I_C = 1\text{ mA}$, $Z_O = 50\ \Omega$

100	0.960	-21.33	3.404	164.99	0.046	77.57	0.986	-9.38
200	0.943	-40.21	3.215	151.43	0.085	64.91	0.938	-18.56
400	0.888	-72.87	2.700	128.23	0.139	46.91	0.838	-31.44
600	0.853	-97.36	2.288	110.64	0.167	34.66	0.757	-40.30
800	0.816	-115.67	1.926	96.26	0.179	26.17	0.706	-46.95
1000	0.788	-129.19	1.659	84.81	0.180	19.95	0.676	-52.20
1200	0.767	-140.35	1.451	74.89	0.174	16.50	0.664	-56.92
1400	0.749	-149.12	1.286	66.48	0.168	14.89	0.662	-61.86
1600	0.734	-156.38	1.162	59.19	0.160	14.19	0.668	-66.10
1800	0.719	-163.17	1.061	52.60	0.149	15.77	0.677	-70.98
2000	0.705	-169.31	0.977	46.28	0.141	19.10	0.683	-75.24
2200	0.694	-174.71	0.893	41.12	0.136	24.16	0.695	-79.81
2400	0.683	-179.60	0.825	36.38	0.135	30.74	0.705	-84.33
2600	0.675	-174.53	0.765	32.38	0.141	38.01	0.717	-88.85
2800	0.664	-169.68	0.709	29.26	0.149	45.42	0.729	-93.41
3000	0.653	-165.11	0.667	26.87	0.163	51.07	0.737	-97.77

$V_{CE} = 5\text{ V}$, $I_C = 3\text{ mA}$, $Z_O = 50\ \Omega$

100	0.897	-35.17	8.858	157.25	0.044	71.22	0.940	-17.73
200	0.846	-64.07	7.795	138.86	0.073	55.30	0.816	-31.57
400	0.761	-104.22	5.532	114.15	0.100	39.30	0.626	-45.72
600	0.727	-127.47	4.177	99.10	0.110	33.80	0.530	-52.62
800	0.698	-142.65	3.306	87.99	0.115	31.00	0.483	-57.50
1000	0.681	-152.69	2.715	79.36	0.120	30.86	0.461	-61.55
1200	0.670	-160.54	2.308	72.11	0.121	33.53	0.456	-65.03
1400	0.656	-166.79	2.012	65.45	0.124	35.60	0.461	-69.34
1600	0.647	-172.10	1.793	59.66	0.130	38.30	0.468	-72.55
1800	0.635	-176.87	1.621	54.21	0.135	41.86	0.479	-76.57
2000	0.628	-178.54	1.481	48.73	0.144	45.68	0.490	-80.11
2200	0.616	-173.99	1.351	44.05	0.153	48.13	0.501	-83.71
2400	0.611	-169.80	1.246	39.67	0.167	50.77	0.518	-87.42
2600	0.601	-166.00	1.157	35.62	0.178	53.54	0.528	-91.49
2800	0.597	-162.06	1.079	32.28	0.196	55.92	0.543	-95.09
3000	0.588	-158.02	1.015	29.15	0.215	56.86	0.555	-98.59

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S PARAMETERS (COMMON EMITTER)

Freq(MHz)	S11	∠S11	S21	∠S21	S12	∠S12	S22	∠S22
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$V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$, $Z_O = 50\ \Omega$

100	0.842	-46.44	13.174	151.15	0.040	64.28	0.891	-24.16
200	0.777	-81.34	10.723	130.44	0.062	50.01	0.716	-39.59
400	0.699	-121.57	6.861	106.89	0.080	39.73	0.508	-52.96
600	0.679	-141.39	4.942	94.02	0.089	37.45	0.424	-58.67
800	0.661	-153.84	3.830	84.43	0.096	38.27	0.390	-62.90
1000	0.648	-162.04	3.117	77.09	0.103	40.59	0.376	-66.27
1200	0.641	-168.02	2.643	70.51	0.111	43.94	0.374	-69.52
1400	0.629	-173.53	2.286	64.60	0.120	46.56	0.382	-73.45
1600	0.620	-177.70	2.039	59.33	0.130	48.48	0.390	-76.69
1800	0.610	-177.97	1.841	54.24	0.139	50.63	0.400	-79.97
2000	0.603	-173.76	1.676	49.26	0.153	53.08	0.413	-83.21
2200	0.594	-169.87	1.528	44.84	0.167	53.92	0.426	-86.71
2400	0.588	-166.14	1.413	40.43	0.181	55.16	0.441	-89.93
2600	0.580	-162.49	1.313	36.57	0.195	56.19	0.453	-93.54
2800	0.576	-158.82	1.231	33.47	0.213	57.85	0.466	-96.88
3000	0.565	-155.09	1.156	30.12	0.232	57.84	0.481	-99.87

$V_{CE} = 5\text{ V}$, $I_C = 10\text{ mA}$, $Z_O = 50\ \Omega$

100	0.739	-68.53	20.705	140.20	0.033	59.97	0.784	-35.06
200	0.678	-107.92	14.465	118.48	0.048	46.54	0.555	-51.65
400	0.639	-142.44	8.256	98.88	0.060	44.77	0.362	-62.32
600	0.636	-156.46	5.721	88.62	0.070	47.35	0.306	-66.66
800	0.628	-165.41	4.393	80.84	0.082	51.17	0.286	-70.68
1000	0.620	-171.30	3.549	74.44	0.094	53.84	0.280	-73.86
1200	0.615	-176.02	2.981	68.87	0.108	55.37	0.285	-76.55
1400	0.606	-179.70	2.584	63.58	0.121	57.13	0.297	-80.44
1600	0.599	-176.38	2.298	58.72	0.134	58.54	0.307	-83.02
1800	0.589	-173.12	2.065	54.21	0.149	58.63	0.319	-86.36
2000	0.586	-169.27	1.889	49.40	0.165	59.48	0.329	-88.76
2200	0.573	-165.75	1.719	45.30	0.179	59.22	0.344	-91.59
2400	0.567	-162.49	1.589	41.42	0.195	59.66	0.362	-94.36
2600	0.562	-158.91	1.481	37.55	0.211	59.11	0.374	-97.29
2800	0.558	-155.91	1.385	34.30	0.229	59.13	0.388	-100.28
3000	0.548	-152.46	1.310	31.07	0.248	58.50	0.400	-102.49

NSVF5501SK

S PARAMETERS (COMMON EMITTER)

Freq(MHz)	S11	∠S11	S21	∠S21	S12	∠S12	S22	∠S22
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$V_{CE} = 5\text{ V}$, $I_C = 15\text{ mA}$, $Z_O = 50\ \Omega$

100	0.680	-83.50	24.897	133.56	0.029	56.21	0.704	-41.82
200	0.639	-122.13	16.056	112.77	0.040	47.85	0.468	-57.53
400	0.621	-151.34	8.769	95.48	0.052	50.10	0.300	-67.15
600	0.623	-162.54	6.015	86.49	0.064	53.63	0.258	-70.98
800	0.620	-170.29	4.606	79.25	0.079	57.27	0.244	-74.71
1000	0.611	-175.21	3.708	73.36	0.093	58.61	0.243	-78.49
1200	0.606	-179.14	3.121	67.87	0.107	60.22	0.249	-80.66
1400	0.599	-176.96	2.697	63.02	0.122	61.45	0.262	-84.17
1600	0.593	-174.14	2.394	58.44	0.138	61.14	0.275	-86.76
1800	0.584	-170.85	2.158	54.02	0.153	61.15	0.287	-89.61
2000	0.577	-167.75	1.973	49.36	0.168	61.74	0.298	-91.80
2200	0.569	-164.22	1.790	45.54	0.184	61.18	0.314	-94.29
2400	0.564	-160.80	1.659	41.46	0.201	60.23	0.330	-97.05
2600	0.556	-157.53	1.542	37.83	0.216	60.12	0.342	-99.52
2800	0.552	-154.68	1.446	34.40	0.234	59.34	0.352	-101.94
3000	0.543	-151.47	1.361	31.44	0.253	58.86	0.366	-103.99

$V_{CE} = 5\text{ V}$, $I_C = 20\text{ mA}$, $Z_O = 50\ \Omega$

100	0.641	-94.49	27.471	128.94	0.027	55.26	0.649	-46.11
200	0.620	-130.76	16.818	109.44	0.036	46.79	0.413	-61.30
400	0.615	-156.41	9.019	93.57	0.048	53.11	0.265	-70.11
600	0.619	-165.97	6.162	85.24	0.062	57.92	0.228	-73.77
800	0.615	-172.83	4.701	78.51	0.078	61.14	0.223	-77.54
1000	0.608	-177.23	3.787	72.80	0.092	61.33	0.223	-81.02
1200	0.605	-179.19	3.189	67.44	0.108	63.68	0.231	-83.24
1400	0.597	-175.70	2.755	62.79	0.123	63.07	0.245	-86.33
1600	0.590	-172.88	2.442	58.12	0.138	62.89	0.255	-88.33
1800	0.581	-169.98	2.201	53.81	0.156	63.03	0.272	-91.87
2000	0.578	-166.61	2.013	49.41	0.172	62.58	0.281	-93.44
2200	0.567	-163.21	1.834	45.29	0.187	61.81	0.298	-95.50
2400	0.564	-160.39	1.691	41.48	0.204	61.15	0.311	-98.00
2600	0.556	-157.07	1.572	37.96	0.218	61.01	0.326	-100.45
2800	0.552	-153.99	1.478	34.76	0.239	59.99	0.337	-102.57
3000	0.544	-151.04	1.389	31.49	0.256	58.80	0.349	-104.89

NSVF5501SK

S PARAMETERS (COMMON EMITTER)

Freq(MHz)	S11	∠S11	S21	∠S21	S12	∠S12	S22	∠S22
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$V_{CE} = 5\text{ V}$, $I_C = 30\text{ mA}$, $Z_O = 50\ \Omega$

100	0.606	-108.75	29.954	123.54	0.022	52.56	0.574	-51.26
200	0.604	-140.73	17.448	105.68	0.031	50.23	0.355	-64.86
400	0.610	-161.95	9.185	91.52	0.044	57.91	0.229	-71.81
600	0.617	-169.73	6.244	83.80	0.061	62.49	0.202	-74.91
800	0.612	-175.60	4.752	77.41	0.077	64.49	0.201	-79.23
1000	0.608	-179.42	3.833	71.88	0.091	66.02	0.204	-82.01
1200	0.604	177.51	3.213	66.72	0.108	65.81	0.214	-84.26
1400	0.598	174.16	2.786	62.07	0.124	64.91	0.229	-87.74
1600	0.591	171.45	2.465	57.60	0.141	64.74	0.242	-89.81
1800	0.584	168.71	2.221	53.24	0.156	64.27	0.255	-92.03
2000	0.582	165.57	2.027	48.84	0.173	63.95	0.266	-93.76
2200	0.569	162.47	1.842	44.77	0.189	62.96	0.281	-96.01
2400	0.566	159.27	1.707	41.02	0.205	62.39	0.298	-98.15
2600	0.560	156.39	1.589	37.71	0.221	61.62	0.312	-100.74
2800	0.555	153.39	1.489	34.29	0.241	60.71	0.324	-103.01
3000	0.546	150.41	1.401	31.06	0.260	59.58	0.339	-104.84

$V_{CE} = 5\text{ V}$, $I_C = 50\text{ mA}$, $Z_O = 50\ \Omega$

100	0.587	-124.93	30.667	118.01	0.020	53.81	0.493	-53.52
200	0.607	-151.01	17.135	101.95	0.027	56.26	0.302	-62.86
400	0.618	-167.42	8.863	89.36	0.042	61.87	0.204	-65.99
600	0.625	-173.36	6.015	82.09	0.057	67.05	0.188	-69.08
800	0.625	-178.39	4.579	75.84	0.073	68.51	0.192	-73.08
1000	0.621	178.24	3.676	70.38	0.090	67.50	0.200	-76.57
1200	0.617	175.49	3.102	65.41	0.106	67.96	0.213	-79.88
1400	0.611	172.50	2.675	60.74	0.123	67.75	0.228	-83.13
1600	0.605	170.02	2.371	56.11	0.138	67.29	0.245	-85.73
1800	0.598	167.32	2.131	51.76	0.155	65.91	0.261	-88.36
2000	0.594	164.43	1.944	47.33	0.173	65.72	0.273	-90.18
2200	0.587	161.08	1.771	43.20	0.189	64.76	0.291	-93.08
2400	0.582	158.20	1.636	39.59	0.204	63.82	0.308	-95.85
2600	0.575	155.22	1.517	36.00	0.222	63.08	0.325	-98.58
2800	0.571	151.88	1.420	32.74	0.241	62.62	0.341	-100.91
3000	0.564	149.04	1.345	29.50	0.259	61.30	0.351	-102.73

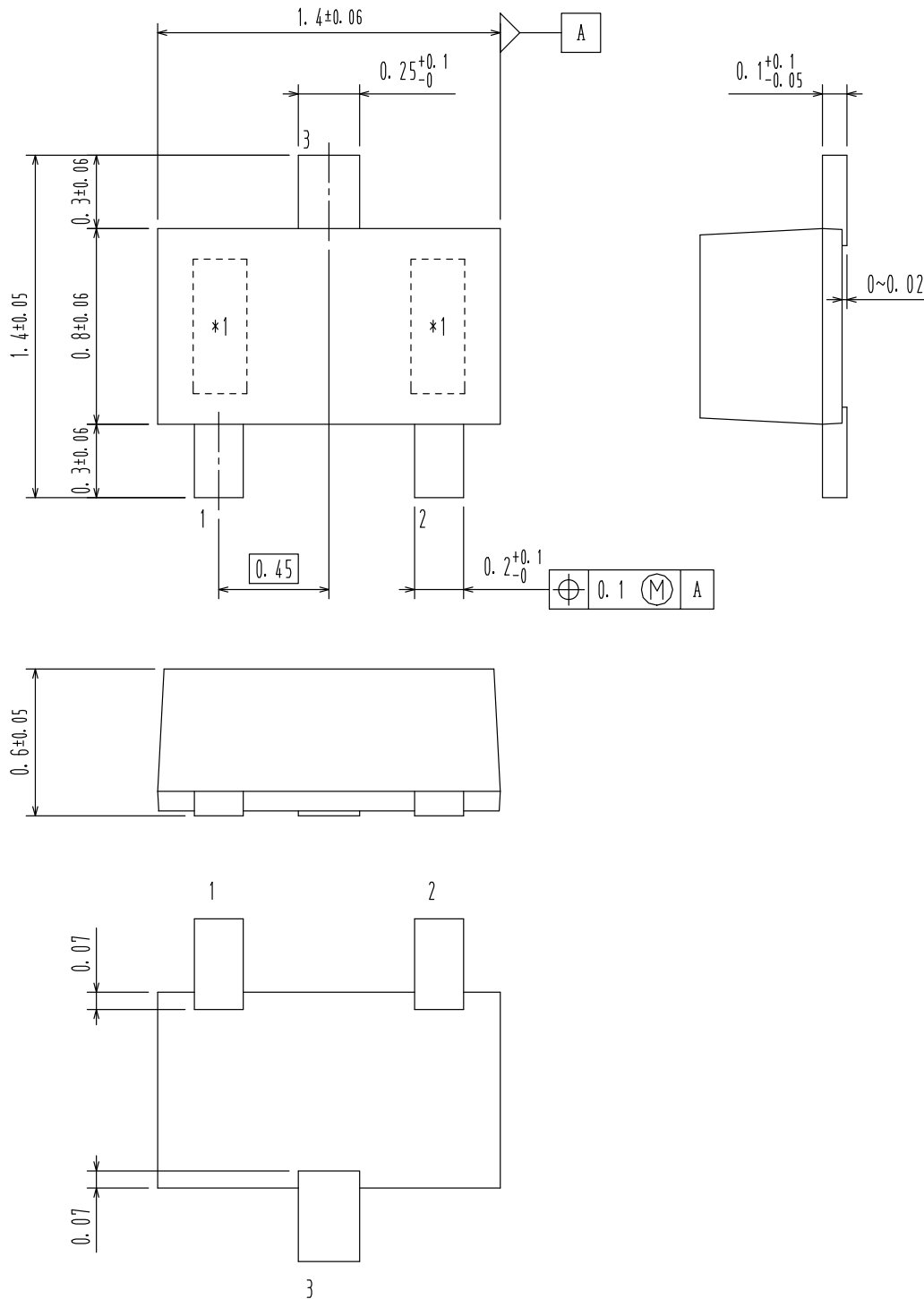
ORDERING INFORMATION

Device	Marking	Package	Shipping†
NSVF5501SKT3G	ZD	SOT-623 / SSFP (Pb-Free / Halogen Free)	8,000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#)

SOT-623 / SSFP
CASE 631AC
ISSUE 0

DATE 29 FEB 2012



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